PATENT SPECIFICATION

Application Date: Aug. 19, 1939. No. 23960/39. 532,184
Complete Specification Left: March 15, 1940.
Complete Specification Accepted: Jan. 20, 1941.

PROVISIONAL SPECIFICATION

Improvements in Poppet Valves and their Manufacture

We, BRITISH AERO COMPONENTS LIMITED, a British Company, of Brico Works, Holbrook Lane, Coventry, in the County of Warwick, ERIC CARPENTER, a British Subject, of 2, Stivichall Croft, Coventry aforesaid, and HUBERT HARRY BROOKES, a British Subject, of "Hillsboro", Lythalls Lane, Coventry aforesaid, do hereby declare the nature of this invention to be as follows:—

This invention relates to poppet valves for internal combustion engines and more particularly to the kind in which an internal cavity in the head is provided to receive a cooling medium, said cavity being closed at the valve head by means of a cap welded thereto.

The disadvantage of valves of the kind referred to as at present produced is that owing to the high temperatures and to the severe and rapidly alternating stresses to which such valves are subjected when in service, it has so far been found very difficult to prevent leakage of the cooling medium at the joint between the cap and the valve head.

Moreover, in the manufacture of valves of this kind it is necessary, owing to the duration of the welding operation and the resulting transmission of heat to the valve, to secure the cap in position before introducing the cooling medium into the cavity. This involves the provision of a hole in the head or stem of the valve for the subsequent introduction of said medium.

The object of the present invention is to provide a method whereby the cap can be secured to the valve head in such a manner as to withstand any influences tending to cause leakage of the cooling medium at the joint, said method having the further advantage that the introduction of the said medium can take place before the cap is secured to the head.

For this purpose according to the invention the cap is butt or projection welded to the valve head at all points simultaneously.

The advantages of this method of welding is that owing to the rapidity with which the welding operation is completed the temperature of the valve as a whole is not appreciably increased. The introduction of the cooling medium into the cavity can, therefore, precede the welding operation. At the same time the joint so formed remains proof against leakage when the valve is in service.

The improved method involves the provision on the valve head and cap of annular welding surfaces surrounded by a flange on one part or the other. The said surfaces are formed in a plane at right angles to the axis of the valve and at the maximum diameter of the valve head. The welding operation is carried out electrically, the cap and valve head being held together under pressure between annular electrodes arranged at opposite sides of the contacting welding surfaces.

In order to facilitate the formation of a firm and effective weld one or the other or both of the welding surfaces may be ribbed or corrugated so as to produce rapid fusion of the two contacting surfaces.

Dated this 18th day of August, 1939.
FLETCHER WILSON, C.P.A., LL.B.,
Agent for the Applicants.

COMPLETE SPECIFICATION

Improvements in Poppet Valves and their Manufacture

We, BRITISH AERO COMPONENTS LIMITED, a British Company, of Brico Works, Holbrook Lane, Coventry, in the County of Warwick, ERIC CARPENTER, a British Subject, of 2, Stivichall Croft, Coventry aforesaid, and HUBERT HARRY BROOKES, a British Subject, of "Hillsboro", Lythalls Lane, Coventry aforesaid, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to poppet valves for internal combustion engines and more particularly to the kind in which an

[Price 1/-]

internal cavity in the head is provided to receive a cooling medium, said cavity being closed at the valve head by means of a cap welded thereto.

The disadvantage of valves of the kind referred to as at present produced is that owing to the high temperatures and to the severe and rapidly alternating stresses to which such valves are subjected when in service, it has so far been found very difficult to prevent leakage of the cooling medium at the joint between the cap and the valve head.

Moreover, in the manufacture of valves of this kind it is necessary, owing to the duration of the welding operation and the resulting transmission of heat to the valve, to secure the cap in position before introducing the cooling medium into the cavity. This involves the provision of a hole in the head or stem of the valve for the subsequent introduction of said medium.

The object of the present invention is to provide a method whereby the cap can be secured to the valve head in such a manner as to withstand any influences tending to cause leakage of the cooling medium at the joint, said method having the further advantage that the introduction of the said medium can take place before the cap is secured to the head.

In the manufacture of poppet valves of the kind herein referred to according to this invention the cap is secured to the valve head by the projection method of electric welding which welds the two parts together at all points simultaneously.

For this purpose one or each of the opposing faces of the cap and valve head is formed with one or more annular projections which, when the cap and valve head are pressed together between live electrodes, welds the said opposing faces together with a uniform and continuous joint.

In order that the invention may be clearly understood and readily carried into practical effect, reference is made in the following description to the accompanying drawing, in which:—

Figure 1 illustrates in section the valve and cap prior to the welding operation.

Figure 2 is a sectional view of the valve and cap during the welding operation.

Figure 3 is a sectional view of the completed valve after the welding operation.

The method of projection welding as applied for the purposes of the present invention involves the provision on one or the other of the surfaces of the valve head and cap which are to be welded together of one or more annular projections so that when the electric welding operation takes place the cap and valve head are welded together at all points simultaneously.

For this purpose, as shown in the drawing, the annular surface a^1 of the valve cap a, which is to be welded to a corresponding annular surface b^1 around the valve head b is formed with an annular rib or projection c which when the parts are assembled for the welding operation bears upon and makes uniform contact with the surface b^1 on the valve head, as shown in Figure 2. The cap is located in position by means of an annular flange d.

During the welding operation the valve head is supported in a bottom electrode e and the cap is pressed into contact with the valve head by pressure applied to the upper electrode f. When the welding current is switched on the annular rib or projection is fused and unites the contacting surfaces a^1 and b^1 of the cap and valve head firmly together at all points simultaneously with a uniform and leak-proof joint.

The great advantage of this method of welding the cap of a hollow valve is that owing to the rapidity with which the welding operation is completed the temperature of the valve as a whole is not appreciably increased. The introduction of the cooling medium into the cavity can, therefore, precede the welding operation and the joint remains proof against leakage when the valve is in service.

The pressure on the upper electrode can be relieved during the actual welding operation to increase the resistance and welding temperature and to allow the metal of the projection to flow between the two surfaces, after which the pressure can be again increased to forge the weld and establish a firm and uniform connection between the contacting surfaces of the cap and valve head.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. In the manufacture of poppet valves of the kind herein referred to, the method of securing the cap to the valve head which consists in projection welding the same thereto at all points simultaneously.

2. In the manufacture of poppet valves of the kind herein referred to, the method of securing the cap to the valve head which consists in forming one or each of the opposing faces thereof with one or more annular projections which, when the cap and valve head are pressed together between live electrodes, welds the said

opposing surfaces together with a uniform and continuous joint.

3. The method of manufacture of poppet valves of the kind herein referred to substantially as herein described and as illustrated in the accompanying drawing.

4. Hollow poppet valves of the kind herein referred to when produced by the method herein described.

Dated this 14th day of March, 1940.
FLETCHER WILSON, C.P.A., LL.B.,
Agent for the Applicants.

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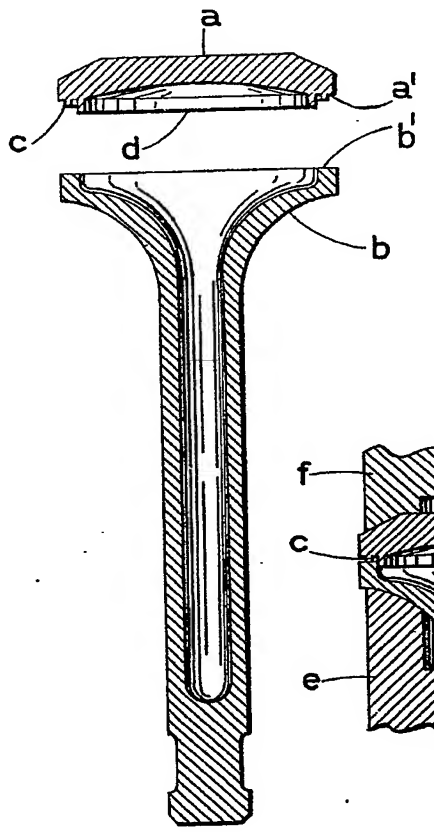

FIG. 1.

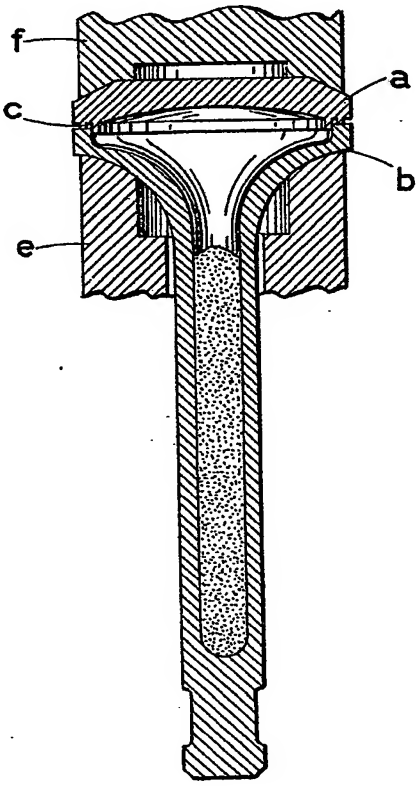

FIG. 2.

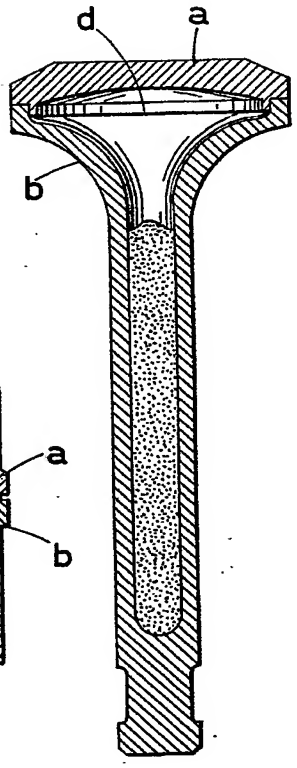

FIG. 3.

Malby & Sons, Photo-Lith.